

CLAIMS

What is claimed is:

- 1 1. A method, comprising:
 - 2 applying predictions of congestion conditions for a traffic stream in a communication
 - 3 network to modify an initial congestion window size for the traffic stream; and
 - 4 applying dynamic bandwidth control to the traffic stream.
- 1 2. The method of claim 1 wherein the dynamic bandwidth control comprises modulating
- 2 inter-packet bandwidths of the traffic stream according to a capacity of a bottleneck in a
- 3 communication path through which the traffic stream passes in the communication network.
- 1 3. The method of claim 1 wherein the predictions of congestion conditions are based on one
- 2 of: (1) monitoring packet losses within the communication network, or (2) monitoring packet
- 3 round trip time in the communication network.
- 1 4. The method of claim 3 wherein the monitoring is performed on at least one of a traffic
- 2 stream-by traffic stream basis, a connection-by-connection basis, a link-by-link basis, or a
- 3 destination-by-destination basis.
- 1 5. The method of claim 4 wherein the monitoring is performed for a period between 0 and
- 2 100 seconds.
- 1 6. The method of claim 5 wherein the monitoring is performed for a period of time between
- 2 30 and 100 seconds.
- 1 7. The method of claim 5 wherein the monitoring is performed for a period of time between
- 2 50 and 100 seconds.

1 8. The method of claim 5 wherein the monitoring is performed for a period of time between
2 60 and 100 seconds.

1 9. A method comprising:

2 setting an initial congestion window for a traffic stream in a communication network
3 according to predicted congestion conditions for that traffic stream; and
4 rate limiting the traffic stream to an effective bandwidth associated with a potentially
5 congested bottleneck in a communication path over which the traffic stream is transmitted.

1 10. The method of claim 9 wherein the rate limiting comprises setting a minimum time
2 spacing between packets within the traffic stream.

1 11. The method of claim 10 wherein the initial congestion window is set up to an advertised
2 window size of a client receiving the traffic stream.

1 12. The method of claim 9 wherein the rate limiting comprises setting the effective
2 bandwidth equal to a maximum transfer rate allowed by the potentially congested bottleneck
3 in the communication path.

1 13. The method of claim 9 wherein the rate limiting is applied using a feedback control
2 process to modulate inter-packet bandwidths in the traffic stream.

1 14. The method of claim 13 wherein the feedback control process is applied at a control node
2 upstream of the potentially congested bottleneck in the communication path.

1 15. The method of claim 9 wherein the predicted congestion conditions are based on one of:
2 (1) monitoring packet losses within the communication network, or (2) monitoring packet
3 round trip time items in the communication network.

1 16. The method of claim 15 wherein the monitoring is performed for a period between 0 and
2 100 seconds.

1 17. The method of claim 16 wherein the monitoring is performed for a period of time
2 between 30 and 100 seconds.

1 18. The method of claim 16 wherein the monitoring is performed for a period of time
2 between 50 and 100 seconds.

1 19. The method of claim 16 wherein the monitoring is performed for a period of time
2 between 60 and 100 seconds.

1 20. A communication network comprising one or more communication paths between one or
2 more content sources and one or more clients, at least one of the communication paths
3 including a control node configured to set an initial congestion window for a traffic stream
4 transmitted over the at least one communication path according to predicted congestion
5 conditions for that traffic stream and to rate limit the traffic stream to an effective bandwidth
6 associated with a potentially congested bottleneck in the at least one communication path
7 over which the traffic stream is transmitted.

1 21. The network of claim 20 wherein the control node is configured to rate limit the traffic
2 stream by setting a minimum time spacing between packets within the traffic stream.

1 22. The network of claim 20 wherein the control node is configured to rate limit the traffic
2 stream by setting the effective bandwidth equal to a maximum transfer rate allowed by the
3 potentially congested bottleneck in the communication path.

- 1 23. The network of claim 20 wherein the control node is configured to rate limit the traffic
 - 2 stream by applying a feedback control process to modulate inter-packet bandwidths in the
 - 3 traffic stream.
- 1 24. The network of claim 23 wherein the control node is upstream of the potentially
 - 2 congested bottleneck in the at least one communication path.
- 1 25. The network of claim 20 wherein the at least one communication path is selected on the
 - 2 basis of prior packet losses thereon.